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## Vowel Shifts in Common Slavic \*

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1. Introduction

The purpose of this paper is to attempt to motivate and explain the vowel shifts which occurred during the history of the Common Slavic (CS) dialect of Indo-European. Common Slavic is the term given to the language which existed prior to the dissolution of Slavic linguistic unity sometime during the seventh century. No known records of Common Slavic exist, but it can be reconstructed by examining the evidence available from the contemporary Slavic languages, as well as pertinent data from non-Slavic languages which are historically attested. According to Shevelov (1965), the period of Common Slavic linguistic unity lasted approximately three millennia, from c. 2000 B.C. to its final break-up into recognizably distinct Slavic languages by 1000 A.D.

Many excellent historical grammars of Common Slavic exist, among them Arumaa 1964, Mikkola 1913, and Entwistle and Morison 1949. My primary source for the data to be discussed in this paper is Shevelov 1965 (henceforth Shevelov), which is by far the most detailed treatment of Common Slavic available in a non-Slavic language. Certainly it is the most detailed and ambitious book of its kind in English. Most works are merely content with listing the established Common Slavic form which corresponds to a given PIE source, without giving any indication of intermediate steps. The works of Arumaa, Mikkola, and Entwistle and Morison, along with that of Bidwell 1963, are primarily of this type, and thus they tend to be of limited use to those interested in studying possible intermediate stages in the development of Slavic phonology. Shevelov, on the other hand, goes much more deeply into the evidence for possible intermediate steps, and so his reconstructions will be of particular importance to the topics I will treat in this paper. I will, therefore, essentially assume Shevelov's reconstructions, although the other works mentioned above have been invaluable background sources in providing perspective on the data.<sup>2</sup>

The structure of the paper will be as follows. First, I will give an overview of the developments of the vowels and diphthongs in Common Slavic from PIE to just before the dissolution of Common Slavic unity, following essentially Shevelov's reconstructions. Included in this overview will be a short discussion of the vowel *jat'* and its effect on the vowel system, the monophthongization of the diphthongs, and finally the developments in the Common Slavic vowel system subsequent to the monophthongization of the diphthongs. An attempt will be made to motivate the changes which occurred. Then, I will show how particle phonology, as developed by Sanford Schane (1982 and class lectures) helps in elucidating some of the observed changes.

## 2. A Survey of the Vowel Shifts in Common Slavic

### 2.1. Developments in the Vowels Prior to the Monophthongization of the Diphthongs

It is generally agreed that the PIE vowel system was as follows immediately prior to the development of Common Slavic:

#### (1) PIE Vowels and Diphthongs

i : e : o : a : u : i e o a u ei oi ai eu ou au

The consensus of the sources named in the introduction is that the old PIE long diphthongs had coalesced with the short diphthongs by the time of the development of Common Slavic. Shevelov cites the following as the first change in Common Slavic from PIE:

(2)	PIE	i :	e :	o :	a :	u :	i	e	o	a	u	ei	oi	ai	eu	ou	au
				∇					∇				∇			∇	
	CS	i :	e :	<sub>o</sub> a :	u :	i	e		<sub>o</sub> a	u	ei		<sub>o</sub> ai		eu		<sub>o</sub> au

As can be observed, Shevelov reconstructs the vowel which results from the merger of PIE [o(:)] and [a(:)] as [<sub>o</sub>a(:)]. Evidently, the vowel was very low, almost like [a(:)], but with some o-type character remaining, perhaps even as an o-type on-glide (Shevelov 1965:150). Most less detailed sources simply state that the above shift resulted in CS [a:] from the merger of PIE [o:] and [a:], and CS [o] from the merger of PIE [o] and [a]. It is true that, ultimately, these are the vowels which resulted, but Shevelov documents [<sub>o</sub>a(:)] as an intermediate stage that was stable for several hundred years prior to the development of [a:] and [o].<sup>3</sup> We have, then, the following vowel system in Common Slavic following the above change:<sup>4</sup>

(3)	i(:)	u(:)	ei	eu
	e(:)			
		<sub>o</sub> a(:)	<sub>o</sub> ai	<sub>o</sub> au

Later, when examining the above shifts in particle terms, we will see that a very plausible interpretation of [<sub>o</sub>a(:)] is [ɔ(:)], which, for the sake of convenience, I will use in some of the following discussion.

Shevelov claims that the above vowel system was inherently unstable due to the fact that the old opposition between [e(:)] and [o(:)] was now lost. The system had become slightly lopsided. It is this unbalanced nature of the system which, according to Shevelov, motivates the next change:

- $$(4) \quad \text{PIE } e(:) > \text{CS}_{e^a(:)}$$

The results of this shift give us the following system:

- $$(5) \quad \begin{array}{cccc} i(:) & u(:) & e^{ai} & e^{au} \\ e^{a(:)} & o^{a(:)} & o^{ai} & o^{au} \end{array}$$

Shevelov is careful to note that, while the merger of PIE [o(:)] and [a(:)] to CS [ɔ(:)] was a shift that resulted in the new phoneme [ɔ(:)], the shift in (4) above was phonetic in nature, only. That is, the phonemic nature of [e(:)] did not change, although its phonetic realization did, probably in an effort to achieve more of an intra-systemic balance. It seems that, phonetically, [e(:)] tended to drift down into a more open vowel in an apparent effort to somehow balance [ɔ(:)]. Interestingly enough, though, a full scale shift of [e(:)] to a lower position did not occur. In the following section I will summarize the major points about the nature of [e\_a(:)] in Common Slavic.

## 2.2. On the Nature of jat' in Common Slavic

It is necessary to briefly consider the phonetic nature of the vowel [e<sub>a</sub>(:)] if we are to gain any insight into the development of the CS vowel system. Traditionally, [e<sub>a</sub>:] is written as ѣ and called 'jat'. I will henceforth follow tradition and write [e<sub>a</sub>:] as ѣ.<sup>5</sup> According to Shevelov, ѣ was 'a vowel of more open and back articulation [than [e:]], but preceded by an on-glide which preserved the original e -type articulation' (Shevelov 1965:164). Thus, 'jat' could have been something like [æ̯].

The problem with y is that the modern Slavic languages exhibit a bewildering array of reflexes which can be traced back to it. Reflexes have been attested from [a] to [i]. (See Shevelov 1965, p. 166ff. for examples). A number of papers and monographs have dealt specifically with jat': Samilov 1964 surveys various reflexes of jat' and concludes that the most likely phonetic value of ǝ was either [ǝ] or [ea]. Indeed, Stankiewicz (1973), in his review of Stieber 1969, quotes the latter's observation that the reflex [ǝ] still exists in some dialects of Bulgarian, as in the words sn'ag, m'asto, and v'ara (no glosses given). Ivid (1959) notes that all of the following reflexes of ǝ are found in various Serbocroatian dialects: [e], [i], [je], [ie], [ej], and [jǝ] (Ivid 1959:50). Shevelov cites evidence from Bavarian German words borrowed from Slovenian that y was rendered orthographically as ie:

- (6) bě<sup>y</sup>l 'white' > Pielach (811 A.D.)  
re<sup>y</sup>ka 'river' > Rieken (982 A.D.) (Shevelov p.168)

Shevelov claims that ie represented the diphthongal character of ě. There are also Finnic loanwords of the period which render ě as ie orthographically (Shevelov 1965:167). Conversely, Shevelov notes that Common Slavic borrowings of Old High German words with ia and ie were rendered as ě:

- (7) CS \* cě<sup>y</sup>gal 'brick' < OHG ziagal (ziegal)  
 Slovenian spě<sup>y</sup>gli 'glasses' < OHG spiegal (Shevelov p.168)

Also, Shevelov cites as indirect evidence for the open nature of ě the fact that Common Slavic borrowings from languages in which the word had a closed [e:] are rendered in Common Slavic not with ě but with [i:]:

- (8) Vulgar Latin mēsa > Old Church Slavic mīsa 'disc'  
 Persian dēv- 'demon' > Old Russian div<sup>y</sup>č (Shevelov p.171)

Shevelov argues that closed [e:] was evidently perceived as being closer phonetically to [i:] than to ě, thereby implying that ě was quite open. During the later period of CS unity and beyond, there is further evidence from loanwords that ě was once again gradually becoming more closed (Newman 1971:326).

The preceding discussion, while not intended to be an exhaustive investigation of the nature of ě, gives sufficient information as to how widely varied its pronunciation must have been during the CS period. In the following section, I will describe how the phonetic nature of ě is connected to the monophthongization of the diphthongs in Common Slavic.

### 2.3. The Monophthongization of the Diphthongs in Common Slavic

Recall that in Common Slavic there were four diphthongs following the coalescence of PIE [o(:)] and [a(:)]. Two diphthongs ended in an [i] off-glide, and two ended in an [u] off-glide. These sets will be referred to as the i-diphthongs and the u-diphthongs, respectively:

- (9)                                ei                                eu  
    ai (=ɔi)                                au (=ɔu)

Now, following the phonetic change which resulted in ě, Shevelov renders the diphthongs as the following:

- (10)
- |      |      |
|------|------|
| e ai | e au |
| o ai | o au |

It is unclear as to whether the diphthongs with short  $\text{ɤ}$  as the first element should be represented as in (9) or (10) above. I will base my discussion on the representation in (9).

The sources I consulted are generally noncommittal about the chronology of the monophthongization of the diphthongs. The consensus is that the monophthongization of both sets of diphthongs occurred at approximately the same time.

The basic tendency in the monophthongization process is that the i-diphthongs monophthongized to front vowels and the u-diphthongs monophthongized to back vowels. The u-diphthongs monophthongized to what Shevelov calls  $[\text{u}:\text{̣}]$ , which is distinct from the  $[\text{u}:]$  which is derived from original PIE  $[\text{u}:]$ . In subsequent developments the original  $[\text{u}:]$  ( $[\text{u}:\text{̣}]$ ) becomes CS  $[\text{y}:]$  ( $=[\text{ɤ}:]$ ), while  $[\text{u}:\text{̣}]$  remains an u-type vowel. (I will consider the shift of  $[\text{u}:\text{̣}]$  to  $[\text{y}:]$ , and its likely motivation, in more detail later.)

The i-diphthongs, on the other hand, developed as follows:

- (11)
- |    |   |    |      |   |            |
|----|---|----|------|---|------------|
| ei | > | i: | o ai | > | $\text{ɤ}$ |
|----|---|----|------|---|------------|

Notice that whereas the u-diphthongs monophthongized to the same long vowel, the i-diphthongs had divergent developments, merging to separate long front vowels.

There is some confusion on Shevelov's part as to the phonetic value of  $[\text{u}:\text{̣}]$ . He realizes that it is not possible to reconstruct the exact phonetic value, but he does say that  $[\text{u}:\text{̣}]$  was 'a less back and probably less rounded vowel than  $[\text{u}:\text{̣}]$ ' (Shevelov 1965:276). He claims that it had a definite u-type quality. Later, he says that 'when later  $[\text{u}:\text{̣}]$  became  $[\text{y}:]$  and lost its rounding, it still did not converge with  $[\text{u}:\text{̣}]$  because of the former's farther back (and possibly lower) articulation' (Shevelov 1965:276). These quotes are confusing to a certain extent, in that in the first he claims that  $[\text{u}:\text{̣}]$  was less back and round than  $[\text{u}:\text{̣}]$ , and in the second quote he says  $[\text{u}:\text{̣}]$  was articulated lower than  $[\text{u}:\text{̣}]$ , even though all along he seems to suppose that  $[\text{u}:\text{̣}]$  was more u-like than  $[\text{u}:\text{̣}]$ .

I would like to propose a different solution, one which Shevelov gives evidence for, but inexplicably rejects. Recall that  $[\text{o}(:)]$  and  $[\text{a}(:)]$  merged to yield  $[\text{o}(\text{a}(:))]$  ( $=[\text{ɔ}(:)]$ ). The vowel  $[\text{ɔ}(:)]$  was quite stable in Common Slavic and exhibits none of the quixotic behavior which  $\text{ɤ}$  exhibits. Therefore, it seems reasonable to assume that the slot in the vowel system which

previously contained [o:] was now empty (note that we are just considering the long vowels here, since the u-diphthongs monophthongized to long vowels):

- |      |    |    |
|------|----|----|
| (12) | i: | u: |
|      | ǣ  | □  |
|      |    | ɔ: |

Therefore, it would not be at all surprising if the u-diphthongs merged first to [o:], given the apparently empty slot. Let us see what evidence can be brought to bear on this issue.

At several places in Shevelov 1965 there is information which seems to provide convincing evidence that the u-diphthongs merged to [o:] upon monophthongization. First of all, Shevelov notes that in Common Slavic loanwords borrowed from Germanic, [u:<sub>1</sub>] renders Germanic [u:], while [u:<sub>2</sub>] renders Germanic [o:]. Some examples follow:

- (13) Czech tyn 'hedger' ~ Anglo-Saxon tūn 'hedger'  
 Old Church Slavic xyzzē 'chamber' ~ OHG hūs 'house'
- (14) Czech buk 'beech' ~ Gothic bōka  
 Russian Dunaj 'Danube' ~ Gothic \*Dōnawi (Shevelov p. 276)

The correspondences in (13) illustrate the use of [u:<sub>1</sub>] to render Germanic [u:] (recall that [u:<sub>1</sub>] later became [y:]), and those in (14) illustrate the use of [u:<sub>2</sub>] to render Germanic [o:]. Such evidence clearly indicates that the u-diphthongs must have originally monophthongized to a vowel something like [o:]. At any rate, this conclusion seems to be a more reasonable and transparent way of accounting for the facts than to assume that there were two distinct vowels [u:<sub>1</sub>] and [u:<sub>2</sub>] coexisting at the same time. Since we know that later [u:<sub>2</sub>] (= [ō:]) came to occupy the slot vacated by [u:<sub>1</sub>] when the latter became [y:], the Slavic spellings above are understandable.

Another bit of evidence that what Shevelov calls [u:<sub>2</sub>] was probably [o:] is connected to the progressive palatalization of the velars in Common Slavic.<sup>6</sup> Briefly, this process acted to palatalize velar consonants in the environment iCV (where C is [+velar]), and it was dependent upon the quality of the vowel following the velar. Palatalization did not occur in this environment when the following vowel was [u:<sub>1</sub>], but it did occur before the more open back vowels [a] and [a:]. (Steenland 1975/74 claims palatalization occurred before [ā(:)] and [o(:)], which indicates that he is not assuming the intermediate stage reconstructed by Shevelov.) Interestingly enough, palatalization also occurred before [u:<sub>2</sub>] (Shevelov 1965:344). If we assume that [u:<sub>2</sub>] was [o:], then the fact that progressive palatalization

occurred before this vowel is captured in a completely natural way, given that it also occurred before the other non-high back vowels, but not before [u:<sub>1</sub>]. But, if we maintain that [u:<sub>2</sub>] was more u-like than o-like (i.e. that it is [+high]), then the statement concerning the environment of the change must be complicated. We would have to say something like: Progressive palatalization occurred before non-high back vowels and before [u:<sub>2</sub>]. Since Shevelov's conception of the phonetic value of [u:<sub>2</sub>] is essentially vacuous, there is no reason not to assume that [u:<sub>2</sub>] is [o:].

The above two arguments are the most persuasive that I can find, and I think they convincingly establish that the vowel resulting from the monophthongization of the u-diphthongs was [o:].

While the above discussion makes intuitively plausible the idea that the two u-diphthongs, upon monophthongization, moved to occupy the [o:] slot vacated by the merger of [o:] and [a:], the situation is not so clear with respect to the monophthongization of the i-diphthongs. It is reasonable to assume that the i-diphthongs would monophthongize to an unfilled slot, if possible. But, since there existed no empty mid vowel slot [e:] into which the i-diphthongs could move, it was necessary for the resulting monophthongs to merge with already existing front vowels. Recall that the front vowel space was already effectively 'filled-up' due to the fact that  $\bar{e}$  apparently did not fully lower in response to the merger of [o(:)] and [a(:)] in the back vowels. As we have previously seen, [e(:)] could appear in a variety of phonetic guises between [e(:)] and [a(:)]. It is this fact which I claim kept the i-diphthongs from monophthongizing to [e:] in a process similar to the monophthongization of the u-diphthongs to [o:].

Let us now examine in more detail how the monophthongization of the i-diphthongs took place. Assuming the representations of the diphthongs as given in (9) above (repeated below as (15)),

$$(15) \quad \begin{array}{cc} \text{ei} & \text{eu} \\ \text{o}_i (= \text{ɔ}i) & \text{o}_u (= \text{ɔ}u) \end{array}$$

we have the following changes:

$$(16) \quad \begin{array}{ccc} \text{ei} & > & i: \\ \text{ɔ}i & > & \bar{e} \end{array} \quad \begin{array}{ccc} \text{eu} & & \\ \text{ɔ}u & & \end{array} \begin{array}{c} \diagup \\ \diagdown \end{array} \begin{array}{c} o: \\ o: \end{array}$$

I will consider the shifts given in (16) in more detail later in terms of particle theory, but some preliminary thoughts as to the reasons for the changes would be in order at this point. One reason given in the standard sources for the monophthongization of the diphthongs in Common Slavic is the fact that there was a tendency in the language towards creating open syllables. By



monophthongizing the diphthongs, syllables were rid of final non-vocalic off-glides. The trend towards open syllables in Common Slavic is not only reflected in the monophthongization of the diphthongs, but in other processes as well. Among these other processes was the elimination of vowel plus nasal sequences: the vowels absorbed the nasality of the following consonants, which were then lost.

Another possible explanation as to why the diphthongs monophthongized is that since the diphthongs could not optimize to the maximal diphthongs [ai] and [au] because [a] had merged with [o] to form [ɔ], they optimized by becoming monophthongs. Of course, this presupposes that the diphthongs which existed in Common Slavic were in some sense 'unstable' or non-optimal. But, it is not entirely clear that all of the Common Slavic diphthongs were necessarily non-optimal. After all, [ɔi], while not completely optimal in the sense of Donegan (1978), is nevertheless the most optimal of all the diphthongs in the Common Slavic vowel system, since each element of the diphthong is maximally distant from the other (recalling that [a] does not exist in Common Slavic at this time). It does seem clear, however, that the other diphthongs in Common Slavic were unstable (or non-optimal) to a greater or lesser extent. In the case of [ei], for example, a natural change in Donegan's (1978) sense would be for both elements to assimilate to each other and become more alike, yielding either [e:] or [i:]. Or, in a system containing the vowel [a], another possible change would be for the elements to maximally dissimilate, yielding [ai]. Since the latter option is impossible in Common Slavic, we would predict that either of the other possible outcomes, [e:] or [i:], would be the result in this case. As we saw in (15) above, [i:] turns out to be the resulting monophthong. In the following discussion, as well in section 3 (where I will consider the monophthongizations in particle terms), I will suggest a possible reason that [i:] resulted instead of [e:].

Upon examining the diphthongs in Common Slavic we notice that both [ei] and [ɔu] contain elements which agree in the feature [back]. In [ei], both elements are [-back], while in [ɔu] both are [+back]. In the case of [eu], the first element is [-back] and the second is [+back], and in the case of [ɔi] the first element is [+back] and the second is [-back]. Earlier we mentioned that Common Slavic had a progressive palatalization of velars, but there were also two distinct earlier regressive palatalizations of velars, in which a velar became palatalized when followed by [i:], ǣ, or [j]. The history of the Slavic languages is therefore replete with palatalization (or fronting) processes. According to Shevelov, the second regressive palatalization of velars took place at approximately the same time as the monophthongization of the diphthongs. It is documented that the ǣ resulting from the monophthongization of [ɔi] fed this palatalization. But note that for [ɔi] to feed the second palatalization, its first element had to be fronted, since palatalization only occurred before front vowels. Let us suppose that a palatalization (or fronting)

process analogous to the second regressive palatalization occurred within the diphthong itself, palatalizing (or umlauting?) [ɔ] to [ʝ] before [i], with [ʝ] ultimately becoming [æ]. This would give us the diphthong [æi], which would be capable of feeding the second palatalization because its initial element is now [-back].

Extending the idea of applying a process similar to that of the second regressive palatalization to the diphthong [ei], we can account for the fact that [ei] became [i:] in the same way that we accounted for the development of [ɔi] above. The initial element [e] is raised due to the palatalizing influence of the following [i] off-glide. How, then, do we account for the fact that [æi] ultimately became  $\bar{y}$ ? Shevelov says that the original [ɔi] metathesized to something like [iɔ] (= [i a]), which then somehow became [i a] and then finally  $\bar{y}$ . He does not seem to account for how we get from [i a] to [i a]. Evidently, something akin to palatalization is going on, but notice that after metathesis we no longer have an environment for regressive palatalization, since the [i] off-glide is now sequentially initial. We would have the proper environment for progressive palatalization, but, according to Shevelov's chronology, the progressive palatalization does not take place until well after the second regressive palatalization (fed by [æi]) and after the monophthongization of the diphthongs. So, it would simplify matters if we could extend the second regressive palatalization process to account for the fronting of [ɔ] in [ɔi] before the sequence is metathesized to put the [i] off-glide sequence initial. Once [æi] is metathesized, we get [iḁ], which is a plausible phonetic realization of  $\bar{y}$ .

Therefore, I differ with Shevelov's claim that [ɔi] was metathesized to [iɔ] and only then somehow became [iḁ]. If we were to follow Shevelov's analysis, we would have to adhocly appeal to a type of progressive palatalization occurring simultaneously with the second regressive palatalization solely for the purpose of getting [iḁ] from [iɔ]. But, Shevelov himself makes clear that the progressive palatalization occurred much later than the monophthongization of the diphthongs, so it could not have been involved. To be as economical as possible, I feel that it makes more sense to allow the second regressive palatalization to do the work of fronting [ɔ] to [æ] in [ɔi] before metathesis occurs, since it is documented that the second regressive palatalization is operating at this time, anyway.

Thus, assuming that the above discussion is generally plausible, we can account for the development of the i-diphthongs by saying that each underwent a type of regressive palatalization (or umlauting), in which the initial element was fronted (in the case of [ɔi]) or raised (in the case of [ei]) before the palatal off-glide [i]. Later, I will examine these processes in terms of particle phonology, which affords an explicit formulation of the phenomenon involved.

So much for the i-diphthongs. As far as the u-diphthongs are concerned, it would not appear that any type of palatalization was involved in their development, since they end in [u] off-glides.

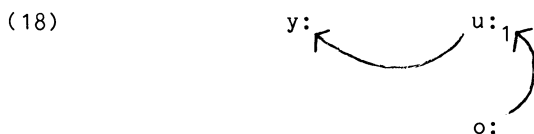
I will put off a detailed consideration of their development to [o:] until the third part of the paper, where I will examine the interactions of the monophthongization of the u-diphthongs with that of the i-diphthongs. Note that we must somehow account for how [eu], which contains both a [-back] and a [+back] element, loses its frontness in becoming [o:]. Particle notation seems to offer an elegant way of accounting for the developments.

#### 2.4. Developments Subsequent to the Monophthongization of the Diphthongs

Following the monophthongization of the diphthongs we have the following system of long and short vowels in Common Slavic:

(17)	i:	u: <sub>1</sub>	i	u
	ɤ	o:	ɤ	ɔ
		ɔ:		

The next observable change is that [u:<sub>1</sub>] becomes [y:] (= [ɨ]),<sup>8</sup> followed closely by the shift of [ɔ:] to [a:] (and [ɔ] to [o]). Shevelov refers to these shifts collectively as the unconditional 'second delabialization of rounded vowels' (Shevelov 1965:376ff.).<sup>9</sup> He therefore claims that [u:<sub>1</sub>] became [y:] due to this principle, whereas I will claim that a more plausible way of looking at this shift is to claim that [u:<sub>1</sub>] shifted as result of being pushed out of the way by [o:]. (Possible motivation for the shift of [o:] to [u:] will be discussed in part 3 of the paper.). The following diagram illustrates this shift:



Such 'push chains' of [o:] to [u:] are well established in the histories of many languages (cf. the Great Vowel Shift in English (Schane 1982, Lass 1976)). As far as I can tell, few Slavic scholars have proposed a chain to account for the shifts documented above.<sup>10</sup> Arumaa (1964) claims that [u:<sub>1</sub>] became [y:] before the monophthongization of the u-diphthongs to [u:<sub>2</sub>] (= [o:]). By making this assertion, which he does not seem to justify, he is unable to explain what caused such an apparently spontaneous shift. After all, by anyone's account, [y:] is more marked than [u:], and it is highly unlikely that such a shift would occur unless motivated in some way. Shevelov, while documenting that the monophthongization of the u-diphthongs to [u:<sub>2</sub>] occurred before [u:<sub>1</sub>] became [y:], still does not clearly account for why the shift occurred. He does

not make clear why [u:<sub>2</sub>] (whatever its phonetic value) should usurp the position of [u:<sub>1</sub>]. Indeed, Shevelov says that [u:<sub>1</sub>] and [u:<sub>2</sub>] exchanged places and that [u:<sub>1</sub>] changed due to the 'purely phonetic character of [u:<sub>1</sub>] as compared to [u:<sub>2</sub>]' (Shevelov 1965:382). Also, he states that 'because of its back articulation [u:<sub>1</sub>] could more easily lose its rounding and still preserve its identity. This was the phonetic condition for the change [u:<sub>1</sub>] > [y:]' (Shevelov 1965:382).

It is hard to evaluate what Shevelov means by these statements. They seem confused and vague. I claim that the push chain described above accounts for the data in a way that is motivated and that has been attested in other language families, such as Germanic (cf. Lass' treatment of push chains in Swedish in Lass 1976:78ff.). Interestingly enough, the push chain Lass (1976) describes in the back vowels of Swedish looks remarkably like the shift I am proposing for Common Slavic, except that in Swedish [u:] becomes what Lass writes as [Ě:] (a nonce symbol), since there already existed a [y:] in the Swedish vowel system.

It would be nice if the push chain which we have just described in Common Slavic could somehow be shown to have caused (even indirectly) the subsequent shift of [ɔ:] to [a:]. Other than to speculate that the change of [ɔ:] to [a:] may be due in some way to the tendency for a more marked vowel to become less marked (assuming that [ɔ:] is more marked than [a:]), I will leave that matter at that.

To complete our survey of the development of the Common Slavic vowel system up to the end of the period of Common Slavic unity, we have the following system subsequent to the push chain of [o:] to [u:] and [u:<sub>1</sub>] to [y:], and the shifts of [ɔ:] to [a:] and [ɔ] to [o]:

(19)	i:	y:	u:	i	u
	ǣ			ǣ	o
	a:				

Sometime after the above shifts, short ǣ became simply [e]. Note the beginning of the breakdown of length oppositions. This tendency was furthered later by the loss of the jers, [i] and [u], under circumstances beyond the scope of this paper. At this point, setting apart the complex vowel ǣ, we get the coalescence of the remnants of the long and short vowel subsystems, with subsequent loss of all phonemic length distinctions:

(20)	i	y	u
	ǣ	e	o

Of course, the status of  $\underline{y}$  remains problematic to the present day in the modern Slavic languages.

### 3. A Particle Analysis of the Vowel Shifts in Common Slavic

In this section I will reexamine several of the vowel shifts discussed in the first part of the paper in terms of particle phonology, a framework being developed by Sanford Schane (1982 and class lectures). Briefly, in particle phonology, vowels are represented abstractly as unordered sequences of primitive 'particles', which represent vowel quality. There are three primitive particles: 'i' represents palatality, 'u' labiality, and 'a' aperture (or height). 'i' and 'u' are tonality particles, and 'a' is an aperture particle.<sup>11</sup> Different combinations of the primitive particles represent different vowels. For example, the long and short vowel systems of PIE would be represented as follows:

(21)	i i	u u	i	u
	ai i	au u	ai	au
	a a		a	

The representation of the vowel [e] as 'ai' indicates that this vowel has both palatality and aperture. In general, lower vowels contain more aperture particles than higher vowels, with the highest vowels [i] and [u] containing no aperture particles at all. In the subsystem of long vowels, the single particles appearing separated and to the right of the others denote length. This illustrates the multi-faceted nature of particles in the theory. They behave like cover terms in that 'i', for example, can represent both palatality and length, depending upon the context. The particle 'i' can also represent tenseness in vowel systems where tense/lax distinctions exist. The particle 'a' can represent either lowered height or laxness, depending upon the system (see Schane 1982 for examples from the Great Vowel Shift in English which motivate the multi-faceted nature of particles). Vowels containing 'i' or 'u' are tonality, or chromatic, vowels, while vowels containing only 'a' are achromatic (see Donegan 1978 for further discussion of chromatic and achromatic vowels). The framework also assumes that it is possible for vowels to have no particles at all in their representations. The vowel [ɜ:], for example (which we are writing as [y:]) contains no particles, since the vowel has neither the tonality of [i] nor the labiality of [u]. We will represent it notationally as 'Ø'. We see, then, that in particle phonology the particles represent both segments and features. No claim is made, however, as to the particles having actual phonetic reality. The representations are merely a model for looking at how vowel systems behave.

The analysis I will present presupposes several theory-based

assumptions: Vowel systems, such as the PIE system in (21) above, will be thought of as being made up of vowels with particle representations. In other words, the units which will be examined as undergoing various changes are the particles existing in the system. Symbols like [o] and [e], etc., will only be used as convenient mnemonic devices to refer to the unordered sequences of abstract particles which are recognized as distinct sound units in the language. In the course of historical change, particle representations may break apart (fission) and rejoin to form new combinations (fusion). Certain sequences of particles are assumed to be particularly unstable and susceptible to fission, such as those containing both tonality particles 'i' and 'u' (this assumption is based mainly on the empirical notion that vowels such as [ū] ('iu') and [ō] ('aiu') are, in some sense, more complicated than vowels such as [i] and [e]). It will furthermore be assumed that particles resulting from the fission process may influence other particle representations to a greater or lesser extent. In addition, the framework proposes explicit notational formulations for assimilation (cloning).

Finally, in a more general sense, the model assumes that, regardless of the number of particles we start out with, we should view vowel systems as closed systems, in which no net gain of particles will be allowed unless the gain is sanctioned in some way (cf. the discussion to come with regard to cloning processes in Common Slavic).

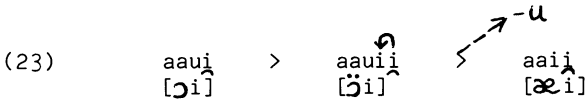
Turning now to the Common Slavic data, I will reexamine some of the vowel shifts in the particle framework. As will be seen, the framework enables us to account in an interesting and explicit way for many of the processes affecting vowels in Common Slavic.

### 3.1. The Monophthongization of the Diphthongs in Common Slavic

In this section I will again consider the monophthongization of the diphthongs in Common Slavic, but this time in terms of particle notation. Recall the previously discussed changes:

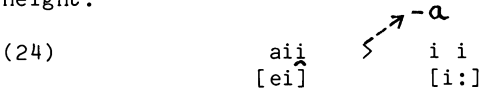
(22) 
$$\begin{array}{ccc} \text{ei} & > & \text{i:} \\ \text{ɔi} & > & \text{ɤ} \end{array} \quad \begin{array}{ccc} & \text{eu} & \\ & \diagdown & \diagup \\ & & \text{o:} \\ & \diagup & \diagdown \\ & \text{ɔu} & \end{array}$$

How would particle phonology handle these changes? Recall that the general consensus is that all of the monophthongizations probably occurred at the same time. Keeping in mind the earlier discussion concerning the prevalence of palatalization processes in Common Slavic at this time, I would like to suggest that a reasonable starting point for the monophthongizations would be in the i-diphthongs, with the first element palatalizing (or umlauting) under the influence of the following [i] off-glide.<sup>12</sup> In particle notation we have the following:



The process in (23) suggests a hypothetical intermediate stage in the development of e from [ɔi]. The hypothetical stage [ɔ̃i] is unstable due to the presence of the particles 'i' and 'u' in the same mora, and thus immediately results in [æi]. The process by which a copy of the 'i' off-glide particle is copied into the particle representation of the first mora of the diphthong is called cloning in particle phonology. Actually, cloning is an explicit way of looking at assimilation involving vowels. The copying (or cloning) of the 'i' particle represents the assimilative character of the change. Note, also, that after cloning the resulting vowel [ɔ̃i] is so unstable that we presumably have a simultaneous decay of the old tonality particle 'u', thereby giving [æi], which, following metathesis, became [iæ], a plausible representation of e (cf. section 2.3 above).<sup>13</sup>

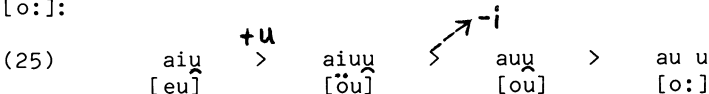
How would particle notation account for the change from [ei] to [i:]? It appears to be a change of the same type that occurred from [ɔi] to [æi], except that here we have assimilation to height:



Here, assimilation of the palatal particle 'i' involves discarding an aperture particle. In doing this we achieve maximum tonality, in that the aperture particle, whose presence had diluted tonality, is no longer present. Such a process has been dubbed droning by Schane (class lectures). Once again, we note that a non-optimal diphthong has become optimal in some sense--since it could not become the optimal diphthong [ai], it was forced to monophthongize to [i:].

We have seen, therefore, that the changes in the i-diphthongs can be accounted for by appealing to the notion that assimilation is involved in each case to shift the initial element up one step towards greater palatality.

Now that we have looked at the monophthongization of the i-diphthongs in particle terms, let us examine the monophthongization of the u-diphthongs. Recall that both u-diphthongs become [o:]. Suppose the following occurs in the change from [eu] to [o:]:



Once again I propose that a hypothetical stage is involved, [öu], and also [ou]. As was previously the case with [ɔ̃i], it is proposed that [öu] is very unstable and decays immediately to the

intermediate diphthong [ou], with concomitant loss of 'i'.<sup>14</sup> Where does the added 'u' particle come from in (25)? Since we have been claiming that a palatalization process (or umlaut), triggered by a following 'i', caused the changes observed in the i-diphthongs, we might want to extend the analysis to claim that something similar happened in the u-diphthongs. That is, we might want to say that the observed changes in the Common Slavic diphthongs can be ascribed to a process of assimilation to tonality (which would include assimilation to both 'i' and 'u').

But recall that in the change of [ɔi] to [æi] (illustrated in (23) above), an 'u' particle was cast off when the unstable diphthong [ɔi] decayed. One might suppose that this stray particle was picked up by [eu], resulting in [öu], which then decayed to [ou]. There is something intuitively nice about this second way of looking at things, in the sense that the stray 'u' continued to exert influence within the subsystem of diphthongs.

Whichever account is the correct one, we nevertheless get [ou] following the decay of [öu]. How might we account for the conversion of [ou] to [o:] in particle terms?

The diphthong [ou] is represented as 'auu' in particle notation, and [o:] can be represented as 'au u'. Notice that the only difference is that in [ou] the final element is non-syllabic, while in [o:] it is not. The number of particles is the same in either case. In particle phonology we can account for the change of [ou] to [o:] by the process of fusion. That is, the sequential realization of the particles 'auu' has changed to a simultaneous (fused) realization, 'au u'. But, why should [ou] become [o:] and not [u:]? I claim that [ou], like [ei], is a non-optimal diphthong. To become an optimal (maximally polarized) diphthong ([au]) is not possible because the vowel [a] does not exist in the system. Therefore, analogous to what happened to [ei], [ou] monophthongizes, but since the [o:] slot is empty, it need not monophthongize to [u:]. Besides, one would expect that the diphthong would monophthongize to an empty slot, if possible, in order to avoid merging with an already existing vowel. In addition, if we assume that the catalyst in the change of [eu] to [o:] was not assimilation to 'u', but rather the capture of the stray 'u' particle which resulted from the earlier change of [ɔi] to [æi] (as suggested previously), then we could assume that the tendency of vowels to assimilate to 'u' (if any) in Common Slavic was not as strong as the tendency of vowels to assimilate to 'i'. Thus, we could conclude that the lack of motivation of assimilation to 'u', together with the open slot [o:], conspired to force [eu] to become [o:].

What about the case of [ɔu] becoming [o:]? A plausible intermediate step would be the following:

(26)      aau       $\nearrow -a$       au      >      au u  
          [ɔ̃u]                    [ou]                    [o:]



The step from [ɔ] to [o] is plausible because later in Common Slavic we actually have the shift of [ɔ] to [o] in the short vowel system (see section 3.2 below). Therefore, once we get to [ou], we can apply the reasoning discussed previously in order to motivate the change of [ou] to [o:].<sup>15</sup>

At this point let us note that in each subsystem of diphthongs (i-diphthongs and u-diphthongs) we get a net loss of one aperture particle per subsystem when the diphthongs monophthongize: one 'a' particle each is lost in the shift of [ei] to [i:] (see (24) above), and in the shift of [ɔu] to [o:] (see (26) above). It is interesting to speculate whether there might be some sort of principle in the system which constrains the changes in such a way as to allow for the loss of no more than one aperture particle per subsystem. The upshot of such a principle (call it the Maximum Loss of Aperture Principle for the Common Slavic diphthongs) seems to be that the tendency in the system towards simplification (represented via net loss of particles) was not unbounded or arbitrary with respect to the number of particles lost, but rather that the changes in the subsystems of the diphthongs were intimately interrelated, with the changes in each constraining the other. This interrelationship seems to be reflected in the balance in the number of particles lost.

Another interesting fact to note is that, in vowel systems where tense/lax distinctions are operating, the representation 'au u' can be interpreted either as the long lax counterpart of [u:], or as a long vowel of the next lower height. That is, 'au u' can stand for either [ʊ:] or [o:]. Recall that Shevelov, as well as others, claimed that the u-diphthongs merged to [u:], which is vaguely described as an u-type vowel. It seems possible that the [o:] which was rendered as [u:] in Common Slavic loanwords from other languages may have been perceived by the speakers of the time as [ʊ:], which could account for why borrowed [o:] was written as u. Does this hint at a beginning tense/lax distinction in Common Slavic? The data are unclear. As we have seen, it is best to think of [u:] systemically as [o:]. But it is interesting that the particle framework allows us to capture the ambiguity of the situation by representing [o:] (which could have been heard as [ʊ:]) in the particle notation 'au u'. Undoubtedly, more could be done with this idea.

### 3.2. Developments Subsequent to the Monophthongization of the Diphthongs

Recall from section 2.4 above that, following the monophthongization of the diphthongs, we had the following system of vowels:

(27)	i:	u: <sub>1</sub>	i	u
	ɤ	o:	ɤ	
		ɔ:		ɔ

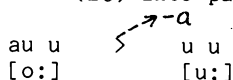
Next we suggested the push chain schematized in (18) above, repeated here:

(28)



Translating the changes in (28) into particle notation we have:

(29)



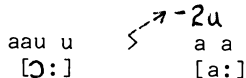
(30)



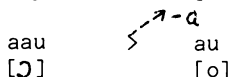
Can we account for what motivates the shift of [o:] to [u:]? Donegan (1978) maintains that the more tonality a vowel has, the more likely it is to gain even more tonality and to lose aperture (the 'rich get richer principle'). This appears to be what is happening to [o:] in Common Slavic, as well as in other languages which have vowel shifts of this same general type (cf. the Great Vowel Shift in English). By shifting upwards, the tonality of [o:] becomes less diluted, since the aperture particle 'a' is lost. Given this, the seemingly marked process of [u:] becoming [y:] is accounted for due to the fact that [u:] was pushed out of the way when [o:] became [u:]. In other words, the shift of [u:] to [y:] was motivated in that the shift of [o:] to [u:] occurred. Generally, we would like to say that an unmotivated change can not occur unless some other force in the system causes it to occur. Thus, in the above push chain, a natural change (in the sense of Donegan 1978), [o:] to [u:], causes as a by-product the relatively marked change of [u:] to [y:]. In another sense, however, both of the shifts above illustrate natural changes to the extent that they result in a net loss of particles.

The two final shifts that I will discuss also illustrate changes from marked to unmarked, which in particle phonology is represented by reducing the number of particles in a vowel representation. The shifts are [ɔ:] to [a:] and [ɔ] to [o]:

(31)



(32)



In each case we see that there is a net loss of particles. In general, as was noted earlier, we would like to claim that the

total number of particles in the system should not increase without motivation. Loss of particles can be analyzed as simplification, but net gain of particles should be accounted for in some way (such as through assimilation (cloning)).

Therefore, in the developments subsequent to the monophthongization of the diphthongs, we have had a net loss of two aperture particles, four labiality particles, and no gains. During the time of the monophthongization of the diphthongs, there was also a net loss of particles. Any particles which were added at this time were accounted for by cloning.

#### 4. Conclusions

I have examined the vowel shifts in Common Slavic with the purpose of trying to account in a somewhat principled way for why the changes might have occurred as they did. I have explored several historical arguments concerning the monophthongization of the Common Slavic diphthongs, and have argued against Shevelov's proposal of [u:] in favor of [o:] as the vowel to which the u-diphthongs monophthongized, and I have also shown how this analysis better accounts for the resulting shift (push chain) of [u:] to [y:]. In addition, I have proposed reasons as to why the i-diphthongs monophthongized to the vowels that they did.

An important result of the present analysis is that it shows that the shifts in the back vowels in Common Slavic, although superficially quite different from those which are attested in the histories of other languages (cf. the Great Vowel Shift in English, the Old High German Vowel Shift, etc.), were actually remarkably similar to these other shifts, if they are analyzed as in the present study. Indeed, it would appear that all of the above mentioned examples (including Common Slavic) are governed by the same generalization, namely that all involve the raising of [o:] to [u:], with the details of what vowel the original [u:] shifts to depending upon the individual language.<sup>16</sup>

Particle phonology and the conceptions of naturalness suggested by Donegan 1978 offer an insightful way of looking at the shifts. It was proposed that certain shifts in the diphthongs could be analyzed in terms of cloning, as well as by taking into account what constitutes an optimal diphthong. The reasons as to why the non-optimal diphthongs monophthongized in Common Slavic were discussed in the framework. Particle phonology also makes available certain concepts such as fission and fusion which nicely account for several of the observed changes.

Finally, another thought about *jat'*. It was argued that *jat'* owes its behavior (i.e. its tendency to lower) in large part to the fact that, in the back vowels, [a(:)] and [o(:)] merged to [ɔ(:)], thereby creating an unbalanced system. *Jat'* attempted to balance the system, therefore, by lowering. It appears that one can take the behavior of *jat'* as indirect evidence for the historical reality of [ɔ(:)], which (as was noted earlier) is not generally assumed to have existed by most sources (except for

Shevelov, who wrote the vowel as [<sub>o</sub>a(:)]]. What better explanation is there for the tendency of PIE [e(:)] to lower than its attempt to balance [ɔ(:)] in the back vowels? If we do not assume [ɔ(:)] as an intermediate stage, then how can we account for the behavior of jat'? It therefore seems that Shevelov is right in setting up [ɔ(:)] as an intermediate stage, especially when we consider the behavior of the system as a whole. Even more interesting is that the intermediate stage [ɔ(:)], rather than being an unremarkable intermediate step in the history of the Common Slavic vowels (recalling that, ultimately, [ɔ:] > [a:] and [ɔ] > [o]), actually had a lasting effect on the system, the evidence for this being the behavior of jat'.

##### 5. A Consideration of a Broader Question

At this point I would like to consider briefly a broader question raised by the above analysis of Common Slavic vowels in the particle framework. It is apparent that the analysis given in this paper makes the assumption that systemic vowel change can in some sense be looked at as analogous to syntagmatic (sequential) vowel change. But, it is not immediately clear that there is good reason to approach these two types of change in the same way. For example, it is not at all uncommon in languages for the two vowels [a] and [i], occurring in sequence, to merge to form [e] (cf. Sanskrit sandhi phenomena as one example). Much the same can be said for the merger of the vowels [a] and [o] to [ɔ], and for the merger of [a] and [u] to form [o]. In the case of the merger of PIE [a] and [o] to form [ɔ] in Common Slavic, particle theory would say that 'a' and 'au' fused, yielding the new vowel 'aau'. In this case, one represents the systemic merger of [o] and [a] to [ɔ] in much the same way as one might represent the change if the two vowels were in a sequential timing relationship. So, what I am in effect assuming, and what the particle framework seems to claim, is that we can consider diachronic systemic change along the same lines as syntagmatic change. In the particular case I just considered, the assumption that these two types of change can be productively looked at in much the same way notationally seems to lead to no problems, as long as we keep in mind that we are really talking about two basically different types of change: systemic change, in which two vowels/phonemes which are configurationally contiguous in the system (but not necessarily contiguous sequentially) merge to yield a new phoneme in the system; and syntagmatic change, in which two vowels which occur as sequentially contiguous blend or merge with each other (as in the case of the Sanskrit sandhi mentioned above). Again, there does not seem to be any a priori reason to look at these two types of change in the same way, even though, at this point, I can see no objection to doing so. The results are the same in one respect in that a new vowel results in each case, but the two cases differ in scale: in the systemic change, we are talking about a global, across-the-board phonemic change, while in the syntagmatic change we are not

necessarily talking about the merger of two phonemes, but rather about a local change involving the juxtaposition of two vowels in sequence. Such a local merger may or may not play a part in affecting the vowel system as a whole.

In a sense, one might want to claim that the ability of particle theory to capture both types of change with the same notation is a potential strength of the framework. Clearly, though, more work needs to be done on this point in the future to work out exactly what the relationship between the two types of change, and the potential consequences for particle theory, will be.

### Footnotes

\* I am indebted to the suggestions and criticisms of Sanford Schane, Ronald Langacker, Margaret Langdon, and Matthew Chen, all of whom patiently read and commented on earlier versions of this paper. Of course, all errors and omissions are exclusively my own.

<sup>1</sup> The Slavic languages include twelve present-day languages: Russian, Belorussian, Ukrainian, Polish, Lower Sorbian, Upper Sorbian, Slovak, Czech, Slovenian, Serbo-Croatian, Macedonian, and Bulgarian.

<sup>2</sup> Vaillant 1950 and Jakobson 1962 are also classic sources which are often cited in the literature, but my limited knowledge of French precluded me from making detailed use of these works.

<sup>3</sup> Evidence for the intermediate stages is also noted by Arumaa 1964:77. The reader is directed to Shevelov 1965 and Arumaa 1964 for the details. It would be beyond the scope of this paper to go into the justification of Shevelov's reconstructions here.

<sup>4</sup> The vowels of the Common Slavic period were also characterized by having certain pitch or tone distinctions which I have ignored. These distinctions do not seem to have played any part in the development of the vowels and diphthongs.

<sup>5</sup> In this paper we will not be specifically concerned with the short reflex of PIE \*[e]. I will use the symbol  $\bar{e}$  to refer to the (long) reflex of PIE \*[e:], with the understanding that both long and short *jat'* share the behavior described in section 2.2.

<sup>6</sup> As noted later in the text, Steensland 1975/74 notes this connection explicitly. The evidence can be found in Shevelov 1965, but not with regard to showing how this evidence can be used to argue that [u:<sub>2</sub>] was [o:]. Shevelov rejects this claim.

<sup>7</sup> This is essentially Steensland's claim, but while he claims that [u:<sub>2</sub>] was a fairly open vowel, he never makes the claim that [u:<sub>2</sub>] was [o:].

<sup>8</sup> Press 1977 discusses in detail the development of the vowel [y:] in the Slavic languages. Note that I will use the traditional Slavic symbol for the vowel [±], which is [y].

<sup>9</sup> It should be noted that Shevelov cites the fact that the second delabialization of rounded vowels did not affect [u:<sub>2</sub>]. Note, also, that the first delabialization was conditioned only,

and it<sub>10</sub> will be ignored in this paper.

<sup>10</sup>Steensland 1975/74 does note that something like a push chain<sub>11</sub> is going on.

<sup>11</sup>In this paper I will denote particle representations in the body of the text within single quotes.

<sup>12</sup>The cloning solution described in this section was suggested to me by Sanford Schane. It should be noted that the half-moon symbol under a particle denotes that the particle is non-vocalic.

<sup>13</sup>It is possible that the loss of the old tonality particle (as opposed to the new one) in situations like these may be a universal.

<sup>14</sup>Nearly all of the sources note that there are some reflexes of [eu] of the form [iu] along side of [u:]. We can account for such cases by supposing that the 'i' particle was not lost in these cases, but that it was retained, giving the representation 'iauu' (= [jou]), and presumably then 'iau u' (= [jo:]), which then later participated in the push chain, becoming finally [ju:].

<sup>15</sup>The derivations in (24), (25), and (26) above deserve a few extra comments. In (25) and (26), the final step from [ou] to [o:] involves the reinterpretation of the particle representing the off-glide [u] as a length marker. As a result of this reinterpretation, we see that the 'u' particle which had previously represented a glide now represents length and is set off from the other particles by a space. In the case of (24), there is another step in the derivation which is implied but not explicitly shown. This step, too, involves the reinterpretation of the off-glide as a length marker:

(24')            ai<sub>i</sub>            i<sub>i</sub>            >            i i  
                  [ei]            [i<sub>i</sub>]            [i:]

↗ -a

As can be seen, the extra step assumes the unstable diphthong [i<sub>i</sub>] as an immediate result of the raising of the first element [e]. Since [i<sub>i</sub>] is so unstable, it immediately results in the stable monophthong [i:] via the reanalysis of the glide as a length marker.

<sup>16</sup>See Lass 1976 for a detailed development of this idea, in which he proposes the notion of a metarule as an abstract schema which can be defined on a grammar for the purpose of expressing a cross-linguistic generalization about changes of this sort.

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